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that their notes were delivered independently of the rhythm of this particular group. From observations of the stridulations of other groups in this same colony, I am of the opinion that it is not unusual for these locusts to develop a rhythmic synchronism in small groups.

It would be interesting to know why some species of locusts and crickets possessing the intermittent habit of stridulation tend to develop a more or less perfect rhythmic synchronism while others do not. Although this is true of the two crickets, *Œcanthus niveus* and *Cyrtoxipha columbiana,* I have been unable to note any synchronism in the chirpings of the common arboreal cricket, *Orocharis saltator.* Although large colonies of these crickets may often be heard in stridulation, each individual appears to stridulate in its own leisurely manner independently of its fellows.

H. A. ALLARD

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ON THE PIGMENTATION OF A CLYPEASTROID, MELLITA SESQUIPERFORATUS LESKE[1]

THE common clypeastroids, *Echinarachnius* and *Mellita,* when adult, are characteristically of a brown or (in the former species) reddish-brown color. This seems to be general throughout the group. Taxonomic lists contain, however, numerous references to a greenish coloration of the test of these animals. When preserved in alcohol, or when dried, either after fixation in alcohol or after killing with fresh water, these sand dollars usually assume, for a time at least, a somewhat greenish color. Clark (1899, p. 118) says that specimens of *Mellita sesquiperforatus* Leske (=*sexforis* A. Ag.) collected at Jamaica were delicate olive green [when alive, I infer, though with doubt]. He also gives the coloration of specimens of this species obtained in Porto Rican waters as "usually light olive green (rarely brown) when alive." At Bermuda living individuals of this species are, he says, invariably brown, with no hint of green about them, either on the external surface or in the viscera. When killed in alcohol, however, they become green, and greenish pigment is dissolved by the fluid. This is also true of *Echinarachnius parma* (Clark, 1904, p. 564; Coe, 1912, p. 111).

Now, examination shows that there is at the bottom of this matter—in descriptive lists somewhat confusing—a rather interesting point, which it is the purpose of this note to elucidate.

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[1] Contributions from the Bermuda Biological Station for Research, No. 90.

Mellita, adult, is at Bermuda undoubtedly brown; large specimens (9.0–11.5 cm. in transverse diameter, usually 9.5 cm.), which I have from time to time collected by dredging upon grass-free bottoms of fine sand or mud at Flatt's Inlet, Spanish Point, Two Rock Passage, and other localities, are uniformly brown upon both aboral and oral surfaces, although the different individuals vary somewhat as to shade. Their general hue harmonizes well with that of the substratum. It is improbable that light has had a direct effect in producing pigmentation, since the oral surface, never turned toward the light, is at least as densely pigmented as the aboral one and is frequently (in larger specimens) darker. Young individuals in an active, healthy state were gotten in association with adults during the autumn months. Up to 5 cm. diameter, in one case 8 cm., they were found, with one exception in about 30, to exhibit no brownish coloration whatever; they were, on the contrary, *pure white*, and translucent, the yellowish stomach being easily made out through the test. These individuals were usually 3.5 to 4.0 cm. in transverse diameter. The one exceptional specimen, 2 cm. in diameter, was unusual because it was of a light coffee-brown shade.

When placed in alcohol, or in fresh water, these young *white Mellitas* became bright green; in sunlight the green on alcoholic specimens quickly disappears. Clark (1901, p. 254) notes that some young specimens of *M. pentapora* examined by him were green [in alcohol?].

When kept in aquaria for several days the small white ''sea-plates'' developed, in most cases, local indications of green pigment, although the animals were still quite active. This was also true of the large brown individuals. It was noticed that in cases where a large brown *Mellita* had been damaged by the cutting edge of the dredge, a green coloration was present along the wound when the haul was brought to the surface. Other specimens, apparently uninjured, sometimes developed an olive-green color on the oral surface within half an hour after being transferred from the dredge to a tub of sea water.

Thus the green coloration of *Mellita* is associated with a condition of injury or death. It is possible that the green material may have no connection with the substance responsible for the general brown integumentary coloration of adults.

The green pigment is readily extracted with fresh water. It is not chlorophyll. When an animal is allowed to die in fresh water, the integument and the ordinarily white internal parts of the skeleton of a *Mellita* become bright green. Putrefactive changes decolorize the green extract, and the color can not be restored by alkali, or with H_2O_2. Green extracts are also decomposed, irreversibly, by boiling.

The green color is not seen in faintly acid fresh-water extracts and the *Mellita* remains brown. If such an extract is made alkaline, the green color promptly appears in the extract. The substance responsible for the green hue in dead or injured parts of *Mellita* is in fact a very good indicator. It is colorless in acid, vivid green in alkaline solutions; this color change may be reversed many times. The "turning-point" of the indicator is at an acidity of $p_H = 7.6$–7.8—in a solution more alkaline than neutrality, but well on the acid side of the reaction of sea water ($p_H = 8.1 \pm$). This greening material seems to be present throughout the body of *Mellita,* as freshly secured bits of the (white) internal skeleton turn bright green in alkali. The few available references to the coloration of clypeastroids indicate that the alkali-greening substance regularly occurs in *Clypeaster* and in other genera of this group.

The ovaries of *M. sesquiperforatus* are heavily pigmented by a substance of the "antedonin"-"echinochrome" group. The mature egg itself is light brownish yellow, heavily yolked, and apparently larger than any echinoid egg that has been described. It measures about 0.26 mm. in diameter, and is thus about twice the size of the egg of *M. testudinata* (=*pentapora*), which measures 0.11 mm., though not so large as that of the brittle-star *Ophioderma,* 0.30 mm. in diameter (Grave, 1916, p. 439). The ovarian egg of *M. sesquiperforatus* is surrounded by a gelatinous envelope, the whole being 0.35 ± mm. in diameter. This envelope bears numerous evenly scattered clumps of precipitated reddish-purple pigment, the ovarian stroma being densely crowded with similar "chromatophores." In *Echinarachnius* the "chromatophores" of the egg-envelope are red rather than purple. The purple pigment of the *Mellita* ovaries exhibits the acid-alkali color changes and the absorption spectrum of the "echinochrome" pigments found in sea-urchins, holothurians, crinoids, and even in star-fishes; a dilute extract of a female *Mellita* may therefore be prepared which changes from bright green to reddish purple at a hydrogen-ion concentration of about 7.5, the "echinochrome" not becoming orange until a much greater acidity is reached. This pigment becomes blue at an alkalinity of about $p_H = 8.2$; in the ovary it is reddish purple, but it is not in solution.

The interest of these facts lies not so much in their supplying some additional instances of the elaboration of similar (or even? identical) substances—conspicuously pigments—by animals related in descent, but in the evidence which is afforded regarding the reaction of intracellular fluids. Numerous cases illustrating the former point are available from among echinoderms, molluscs, tunicates, and so forth, and these cases have a certain importance for the general theory of animal coloration. But I am here chiefly concerned to point out that, if the alkali-greening substance present in *M. sesquiperforatus* is closely similar to that produced in the tissues of other clypeastroids, unequivocal statements as to the occurrence of greenish hues in living "sand dollars" may contain a suggestion as to a possible mode of origin for certain known geographical color differences in echinoderm species. I have not been able to find such references, but the point is worthy of further study. The evidence afforded by intracellular substances capable of behaving as indicators of acidity shows plainly that the tissues of marine animals are much more acid (less alkaline) than sea water. In *M. sesquiperforatus* the green color is produced when the tissue fluids become more alkaline than they customarily are; thus the integument, when injured or killed, becomes permeable to sea water and assumes a green hue. Healthy individuals for experimental work may, incidentally, be selected (at Bermuda) by the absence of green areas upon the test; the readiness with which greening is induced indicates the degree of care which must be employed in handling some marine animals. If by some means, for example, by higher temperature, the tissues of a *Mellita* population in a warmer sea were constantly maintained at a higher alkalinity than those at Bermuda, they might normally appear somewhat greenish in color. The normal variations in the coloration of *Chromodoris zebra,* a nudibranch containing an indicator favorable for such observations, strongly suggest that such differences in the reaction of intracellular fluids (not necessarily of the protoplasm) are entirely possible (Crozier, 1916). Whether or not comparable changes may be induced as a regular thing in different oceanographic regions can not as yet be stated.

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PEMBROKE,
BERMUDA,
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W. J. CROZIER

A CASE OF ABNORMAL INHERITANCE IN DROSOPHILA MELANOGASTER

AMONG great numbers of cultures one is occasionally found which gives exceptional results not explainable by the usual mode of inheritance. Although such cases do not aid in understanding genetic problems unless the mechanism involved is worked out, the present case seems to be sufficiently remarkable to merit brief mention. The writer has no explanation to offer.

In culture 76, which was made up February 9, 1917, a large preponderance of males was observed, the ratio being 38 males to 3 females, and the males included unexpected classes. The parents of the culture were one homozygous eosin ruby forked female from stock and a male which was normal wild-type in all respects with the exception that the posterior cross veins of the wings were missing. His pedigree is unknown and he was